

Lamiidæ.

Ceroplesis signata, sp. n.

Niger, brevissime pubescens: thorace disco foveato-punctato; elytris fortiter sat crebre punctatis, fascia rufa ante medium ad suturam paullo interrupta ornatis.

Long. $9\frac{1}{2}$ lin.

Hab. E. Africa.

This species is very close to *C. æthiops*, but is relatively narrower and has the elytra a little more acuminate at their apex. The thorax has a strongly marked, impressed, transverse line in front of and behind the disk, so that the disk is more convex than in *C. æthiops*, somewhat shining, with a median impressed line; the sides of the disk with some rather large deep punctures. The elytra are clothed with short pubescence, but the rather coarse and moderately close punctuation is nevertheless visible, especially at the base; just before the middle there is a bright red fascia, nearly rectilinear posteriorly, but obliquely narrowed anteriorly near the suture, where there is a slight interruption.

XIII.—*On the Organization of the Cyprides.*

By Prof. CARL CLAUS*.

SINCE the publication of Zenker's well-known Monograph (1854), although the number of forms described as species and the division of the old Müllerian genus *Cypris* into subgenera and new genera have advanced considerably, our knowledge of the organization of the freshwater "Ostracoda" has made no particular progress. With the exception of my little treatise on the developmental history of *Cypris*, published twenty-two years ago, and the recently issued memoirs of some pupils of Weismann's (Stuhlmann, Nortquist) on the so-called mucous glands, recognized as an ejaculatory apparatus, of the male Cyprides, we stand essentially on the platform of Zenker's Monograph, and for information on the details of organization are compelled to go to that work, which, notwithstanding the imperfect methods of investigation prevalent at the time of its publication, furnished many important results. Nevertheless it does not come up to the present level

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of our knowledge of the organization of the Crustacea, and it was easy to foresee that with the extraordinarily perfected methods of recent times, and especially the preparation of serial sections from hardened and stained objects, numerous gaps in our knowledge of these organisms would be filled up without much difficulty. Consequently I only supplied a pressing desideratum when I again took up the investigation of *Cypris*. The results obtained are briefly summarized here.

1. The *nervous system* consists, besides the brain clothed with a thick ganglionic covering, of an elongated ventral cord containing five pairs of ganglia. The anterior section of the brain, representing the prosencephalon of the Arthropod brain, gives forth the nerves to the tripartite frontal eye and possesses a particularly strong coating of ganglion-cells, in which the centre of projection of the highest rank is probably to be sought. The mesencephalon gives off the nerves to the anterior antennæ, into which, however, fibres from the prosencephalon also enter; at the sides of the metencephalon represented by the exceedingly elongated commissures, which only unite far above the œsophagus, the nerves of the second pair of antennæ originate. The ventral chain of ganglia extends throughout the length of the body to the sexual apparatus, and in its anterior, broader portion passes beneath the projecting cariniform pectoral plate on the side of which the maxillæ and maxillipeds (second pair of maxillæ) originate. This section contains the closely approximated ganglia of the mandibles, maxillæ, and maxillipeds, the muscles of which are supplied by the nerves issuing from them. Beyond the pectoral plate commences the narrower and more elongated division of the ventral cord, the two ganglia of which give off the nerves to the pairs of legs. At the posterior of these terminates the cell-layer, which quite continuously coats the concentrated ventral cord, and the longitudinal fibres of the central mass are continued in two long median stems nearly touching each other, which ramify among the muscles of the abdomen.

2. The *frontal eye*, as in all groups of Crustacea, is tripartite and receives for each of its three divisions a nerve which is rooted in the median layer of the prosencephalon. Each of the three closely connected pigment-cups is occupied by some sixteen to twenty cells, into which the fibres of the nerve enter from the outside beneath a nearly spherical lens. Thus the eye, like the lensless median eye of the Cypridinæ and Phyllopora (*Branchipus*), is an inverse cup-eye. I have found no cuticular divisions such as occur

in the form of bacilli on the visual cells of *Cypridina*, which are turned towards the pigment, but within, turned towards the pigment, I have found a second layer of narrow elongated nuclei, which must belong to a special form of cells. The rounded nuclei of the nerve-cells are placed peripherally, turned towards the entering nerves and the overlying secretion-lens, which is clothed by the delicate integument. In *Notodromus* the three divisions of the frontal eye are separated from each other, and here, as in the *Pontella* and *Oniscidia* among the Copepoda, we have an anterior, ventral, cup-shaped eye and two separated lateral eyes, which are easily distinguished from the composite lateral eyes.

3. *Endoskeleton*.—Beneath the œsophagus, between the stomach and the anterior ganglionic mass of the ventral cord, in front of the transversely placed sinew of the shell-muscle, there is a broad, indistinctly bipartite, chitinous plate, upon which, in agreement with the endoskeleton of the Phyllopoda and other Crustacea, as also with the so-called *endostomite* of the Arachnoidea, pairs of muscles for all the limbs of the trunk, including the second pair of antennæ, are attached. On its anterior margin originate numerous muscular threads, which pass to the lower wall of the œsophagus, and two slender, long, muscular bundles, which pass through the space between the mandibular and maxillary ganglia to the labium.

4. The *alimentary apparatus* commences by a rather narrow atrium, bounded by the labrum and labium, into which the toothed biting edge of the mandibles enters from the right and left. Zenker's "rake-like masticating organs" are situated at the bottom of it, and belong, as a sort of hypopharynx, to the labium. In the bottom of the atrium beneath the labrum commences the buccal intestine, ascending at first nearly perpendicularly and then somewhat obliquely backwards to the stomach. The shorter anterior part of it (œsophagus), which is about equal in length to the atrium, appears to be nearly cylindrical, but with a more strongly arched ventral wall, into which the pair of muscles springing from the endoskeleton and acting as dilators enter. More numerous and larger muscles pass from the integument of the labrum to the flattened dorsal surface of the œsophagus, and draw up its very thick wall, the convex surface of which projects like a valve into the lumen, and thus, in conjunction with the dilators of the lower œsophageal wall, enlarge the lumen, which is horseshoe-shaped in transverse section. The following larger division of the œsophagus (gizzard) appears to be essentially altered in form; it was described by Zenker as a very complicated triturant organ, resembling the human

larynx. It is, however, by no means free, as supposed by that author, but has its larger, hinder portion united with the intestine. Only the smaller, anterior part, embraced laterally by powerful muscular bands and ventrally attached by muscular threads to the endoskeletal plate, lies free in front of the intestine, and is drawn forward by a large pair of muscles originating at the summit of the labrum and running beneath the brain and obliquely over the œsophagus, and backward by a second group of muscles acting in the opposite direction. This forward and backward displacement, which reminds us of the motory mechanism of the gizzard in the Decapoda, affects only the dorsal wall, the strong convexity of which projects into the lumen, beset with rows of pointed teeth, and acts like a rasp against the concave ventral wall, also densely armed with points. It corresponds with Zenker's "Reibzeug," while the part described by that author as "Ringknorpel" represents the bottom and the lateral wall of the œsophagus. The middle intestine is divided by a deep constriction into two sections, of which the anterior surrounds the throat-like opening of the gizzard and gives off the two hepato-pancreatic tubes into the interspace of the duplicature of the shell. It contains a very deep glandular epithelium, and must, as the stomach, have the function of digesting albuminous bodies. The second, far longer but equally wide section of the intestinal tube, the chyle-intestine, appears chiefly to effect the absorption of the nutritive materials. No muscular rectal section in Zenker's sense is present; the anal aperture is a narrow fissure concealed by a valve and placed dorsally from the furcal joints.

5. *Secretory organs*.—Both the antennal gland and the gland of the second pair of maxillæ are well developed in *Cypris*, but it is the former which is removed into the shell-cavity and therefore must be characterized as the *shell-gland*. Its position and form I have already represented correctly in my memoir on the development of *Cypris* (1868), but without tracing the finer structure. It commences above the entrance of the hepato-pancreatic tube into the cavity of the carapace and allows a terminal saccule to be distinguished from the gland-duct, which is somewhat tortuous, but not folded into convolutions. The cells of the former contain small nuclei and are very intensely stained by reagents. Excretory products are often deposited in its lumen. The gland-duct consists only of a series of perforated cells, the nuclei of which are of extraordinary size and emit digitiform branches above and below, each representing only a single perforated cell. The

effluent duct passing towards the antennæ commences near the terminal saccule and is exceedingly difficult to trace.

The *maxillary gland* is situated ventrally to the shell-muscle and appears to consist principally of the terminal saccule divided into several diverticula, from which the effluent duct runs into the shaft of the maxilliped (second maxilla). Besides these excretory organs, characteristic of the Crustacea and representing the nephridia of the Annelida, there are two glands in the labrum, and further some very large gland-like cells in the basal joints of the limbs, and also under the back, and particularly numerous within the carapace attached to the hypodermis of the inner lamella.

6. *Sexual apparatus*.—Like the copulatory apparatus of the males of *Cypridina* and *Halocypris* the complicated penis of the *Cytherides* and *Cyprides* represents a transformed (8) pair of limbs. But the external sexual parts of the female (still erroneously characterized as the *vagina*), which are arched like a capsule, perforated by the sexual aperture, and sometimes furnished with leg-like appendages, are also probably to be interpreted as the basal joints of a pair of limbs, while the two abdominal appendages, which still constantly figure as “*Rami abdominales*” (caudal rami) or as caudal spines, as also the so-called “*postabdomen*” of the *Cypridina* and *Halocyprides*, represent the two *furcal joints* of the Entomostracan body.

The long, fissure-like, sexual aperture, which is surrounded by a chitinous band, receives the oviduct in its posterior section, which is susceptible of dilatation by the action of powerful muscles; and the oviduct runs with many convolutions by the sides of the intestine, and by means of its glandular epithelium secretes the shell-membranes of the contained ova in the same way as the ovarian tube of the Insecta. The genital cleft in its anterior angle, where it is dilated, surrounds the aperture for the reception of the seminal filaments, which are of peculiar form and enclosed by a chitinous loop. A complicated apparatus follows on this copulatory aperture (which is dilatable by a special group of muscles), and consists in the first place of a saccule formed by a chitinous wall, then of a much convoluted glandular tube and a chitinous tube originating from the saccule, leading into the duct of the receptaculum, which is spirally twisted like a watch-spring.